EXPERIMENTAL AND THEORETICAL DETERMINATION OF HEAVY OIL VISCOSITY UNDER RESERVOIR CONDITIONS

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ABSTRACT

The USA deposits of heavy oils and tar sands contain significant energy reserves. Thermal methods, particularly steam drive and steam soak, are used to recover heavy oils and bitumen. Thermal methods rely on several displacement mechanisms to recover oil, but the most important is the reduction of crude viscosity with increasing temperature.

The main objective of this research is to propose a simple procedure to predict heavy oil viscosity at reservoir conditions as a function of easily determined physical properties. This procedure will avoid costly experimental testing and reduce uncertainty in designing thermal recovery processes.

We started reviewing critically the existing literature choosing the most promising models for viscosity determination. The viscosity of heavy oil samples provided by oil producers will be predicted using these models. Viscosity, density and other necessary thermodynamic properties required in the evaluation of the selected models will be determined in our laboratories. For the experimental part, we will use our recently developed technique to measure simultaneously Pressure-Volume-Temperature (PVT) and phase equilibrium compositions for heavy oil/water mixtures. Various mixing rules and volume translation schemes that do not affect the phase equilibrium will be tested to achieve better density predictions.

A critical comparison of the different models with experimental data will allow us to propose the best procedures for heavy oil viscosity prediction from simple laboratory tests.

Graduate and Undergraduate Students Involved in the Project:

Mr. Jacob Tambe is working on this research project since March 2000. Mr. Tambe is developing a computer subroutine to be used in the comparison of viscosity values calculated using different methods.

Mr. Joseph Itzibah, a Prairie View A&M undergraduate student, has also worked during Academic year 2000-2001 on this project.